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EXAMINER	
SONG, SARAH U	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 09/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/042,935	HUANG ET AL.	
	Examiner	Art Unit	
	Sarah Song	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-7 and 9-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-7 and 9-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's communication filed on June 23, 2005 has been carefully considered and placed of record in the file. Claim 15 is amended. Claims 1 and 8 are canceled. Claims 2-7 and 9-19 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 2-4, 9-11 and 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato et al. ((*Optical Coupling Characteristics of Laser Diodes to Thermally Diffused Expanded Core Fiber Coupling Using an Aspheric Lens,* previously relied upon) in view of Papademetriou et al. (U.S. Patent Application Publication 2001/0020164 previously relied upon) and Kawasaki et al. (U.S. Patent 5,594,825 previously relied upon).**

4. Regarding claims 3, 4, 10, 11, 14 and 15, Kato et al. discloses an optical device comprising a TEC optical fiber including a first core, wherein a diameter of the first core at a first end of the TEC optical fiber is larger than the diameter of the first core in an unexpanded portion of the TEC optical fiber; and a focusing lens (aspheric lens) configured to focus light into the first end of the TEC optical fiber such that a light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber. The optical device

further comprises an active component, wherein the active component is a laser diode. See Figure 1.

5. Kato et al. discloses all of the limitations as discussed above, but does not specifically disclose the light spot diameter to be no larger than the diameter at the first end of the TEC optical fiber.

6. Papademetriou et al. discloses the benefits of coupling a light spot having a diameter less than that of the fiber core (paragraph [0040]). One of ordinary skill in the art would have recognized that the teaching of Papademetriou et al. would be applicable to any fiber, including TEC fibers, more specifically, applicable to coupling light into the input face of the TEC fiber. Therefore, it would have been obvious to one having ordinary skill in the art to keep the light spot diameter less than the core diameter at the first end (input end) of the fiber of Kato et al. One of ordinary skill in the art would have been motivated to make the modification in order to minimize energy losses as taught by Papademetriou et al.

7. Kato et al. also does not expressly disclose the dimensions of the fiber core, wherein the diameter of the first core at a first end of the TEC optical fiber is in a range from 20μ to 50μ and a diameter of the first core in an unexpanded portion of the TEC optical fiber is in a range from 6μ to 11μ.

8. Kawasaki et al. discloses TEC optical fibers having a MFD of the first core at a first end of the TEC optical fiber is in a range from 20μ to 50μ and a diameter of the first core in an unexpanded portion of the TEC optical fiber is in a range from 6μ to 11μ (column 3, lines 8-14). Although the expanded core diameter is not expressly disclosed, it appears that the physical core diameter would also be near the range of the MFD since MFD is proportional to expanded core

diameters. It is noted that the ranges of Kawasaki et al. overlap the claimed ranges and therefore, render the claimed ranges obvious (MPEP 2144.05(I)). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the TEC optical fiber of Kato et al. having the diameters as disclosed by Kato et al. since the dimensions disclosed by Kato et al. are disclosed as being effective for reducing power density at the coupling face of the fiber. Therefore, One or ordinary skill in the art would have been motivated to provide the fiber of Kato et al. having a diameter of the first core at a first end of the TEC optical fiber is in a range from 20μ to 50μ and a diameter of the first core in an unexpanded portion of the TEC optical fiber is in a range from 6μ to 11μ in order to prevent damage to the optical fiber end face as taught by Kawasaki et al.

9. Additionally, Kawasaki et al. further discloses light having an optical power that is large enough that contaminants or irregularities at the first end would have caused damaged to the optical end face if the light spot diameter were to have been the same as the diameter of the first core in the unexpanded portion of the TEC fiber (see column 1, lines 55-60).

10. Furthermore, Kato et al. and Kawasaki et al. do not expressly disclose a dielectric coating. However, dielectric coatings are well known in the art for providing on fiber end faces for reducing undesirable reflection at the coupling faces. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the dielectric coating on the end face of Kato et al. to prevent undesired reflections at the end face, as was known in the art.

11. Resultantly, the advantage afforded by the modification of Kato et al. in view of Papademetriou et al. and Kawasaki et al. would also be recognized in the fiber end face having the dielectric coating.

12. The method claims would also be obvious as setting forth requisite steps.

13. Regarding claims 2 and 9, Kato et al. does not specifically disclose the optical fiber comprising an optical fiber pigtail that is permanently affixed to the optical device. Laser diode packages comprising optical fiber pigtails are well known in the art. It would have been obvious to one having ordinary skill in the art to provide the optical device of Kato et al. with an optical fiber pigtail that is permanently affixed to the optical device to prevent misalignment and inadvertent coupling losses between the laser diode and the optical fiber.

14. Regarding claims 16 and 18, Kato et al., Papademetriou et al. and Kawasaki et al. do not expressly disclose the optical power to be at least 1W. However, Kawasaki et al. does disclose prior art fibers exhibiting damage at optical powers of about 100mW (column 1, lines 55-60). Kawasaki et al. further discloses the modified fiber having the expanded core to have a decrease in power density of about a factor of 10, as compared to the power density of a standard fiber (column 3, lines 39-43). Therefore, one of ordinary skill in the art would have recognized that the expanded core fiber would be able to handle optical powers of about 10 times greater than that of the prior art (i.e. 10 X 100mW), which is approximately 1W. Thus the claimed optical power would have been obvious to one having ordinary skill in the art as being close to the optical power handling capability as reasonably deduced from the prior art.

15. Regarding claims 17 and 19, the prior art does not expressly disclose the light spot diameter to be at least 20μ. However, Kawasaki et al. clearly provides the means to provide a

larger light spot diameter in order to reduce optical power density, and Papademetriou et al. clearly provides that the light spot diameter be no larger than the core diameter in order to minimize losses. Therefore, since Kawasaki et al. discloses expanded cores of greater than about 20μ, it would have been obvious to one having ordinary skill in the art to provide the light spot of at least 20μ in diameter in order to minimize optical power density, while also minimizing losses.

16. **Claims 5-7 and 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng (U.S. Patent 5,825,950 previously relied upon) in view of Papademetriou et al. and Kawasaki et al.**

17. Regarding claims 5-7 and 12-15, Cheng discloses an optical device comprising a TEC optical fiber 144a including a first core, wherein a diameter of the first core at a first end of the TEC optical fiber is larger than the diameter of the first core in an unexpanded portion of the TEC optical fiber; and a focusing lens 138 configured to focus light into the first end of the TEC optical fiber. The device further comprises a passive component 140 configured to process the light and output the light to the focusing lens 138. The optical device further comprises an additional TEC optical fiber 132 that includes a second core, wherein a diameter of the second core at a first end of the additional TEC optical fiber is larger than the diameter of the second core in an unexpanded portion of the additional TEC optical fiber, and wherein the additional TEC optical fiber is configured to input the light into the optical device from the first end of the additional TEC optical fiber. See column 5, lines 54-60.

18. Cheng discloses all of the limitations as discussed above, but does not specifically disclose the light spot diameter to be no larger than the diameter at the first end of the TEC optical fiber.

19. Papademetriou et al. discloses the benefits of coupling a light spot having a diameter less than that of the fiber core (paragraph [0040]). One of ordinary skill in the art would have recognized that the teaching of Papademetriou et al. would be applicable to any fiber, including TEC fibers, more specifically, applicable to coupling light into the input face of the TEC fiber. Therefore, it would have been obvious to one having ordinary skill in the art to keep the light spot diameter less than the core diameter at the first end (input end) of the fiber of Kato et al. One of ordinary skill in the art would have been motivated to make the modification in order to minimize energy losses as taught by Papademetriou et al.

20. Cheng also does not expressly disclose the dimensions of the fiber core, wherein the diameter of the first core at a first end of the TEC optical fiber is in a range from 20μ to 50μ and a diameter of the first core in an unexpanded portion of the TEC optical fiber is in a range from 6μ to 11μ and wherein the light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber.

21. Kawasaki et al. discloses TEC optical fibers having a MFD of the first core at a first end of the TEC optical fiber is in a range from 20μ to 50μ and a diameter of the first core in an unexpanded portion of the TEC optical fiber is in a range from 6μ to 11μ (column 3, lines 8-14). Although the expanded core diameter is not expressly disclosed, it appears that the physical core diameter would also be near the range of the MFD since MFD is proportional to expanded core

diameters. It is noted that the ranges of Kawasaki et al. overlap the claimed ranges and therefore, render the claimed ranges obvious (MPEP 2144.05(I)). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the TEC optical fiber of Kato et al. having the diameters as disclosed by Kato et al. since the dimensions disclosed by Kato et al. are disclosed as being effective for reducing power density at the coupling face of the fiber. It is noted that the reduced power density is a result of the light spot diameter being larger than the diameter of the core in an unexpanded portion of the TEC fiber. Therefore, one or ordinary skill in the art would have been motivated to provide the fiber of Kato et al. having a diameter of the first core at a first end of the TEC optical fiber is in a range from 20μ to 50μ and a diameter of the first core in an unexpanded portion of the TEC optical fiber is in a range from 6μ to 11μ, and the light spot diameter larger than the diameter of the core in an unexpanded portion of the TEC fiber in order to prevent damage to the optical fiber end face as taught by Kawasaki et al.

22. Additionally, Kawasaki et al. further discloses light having an optical power that is large enough that contaminants or irregularities at the first end would have caused damaged to the optical end face if the light spot diameter were to have been the same as the diameter of the first core in the unexpanded portion of the TEC fiber (see column 1, lines 55-60).

23. Furthermore, Cheng and Kawasaki et al. do not expressly disclose a dielectric coating. However, dielectric coatings are well known in the art for providing on fiber end faces for reducing undesirable reflection at the coupling faces. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the dielectric

coating on the end face of Kato et al. to prevent undesired reflections at the end face, as was known in the art.

24. Resultantly, the advantage afforded by the modification of Cheng in view of Papademetriou et al. and Kawasaki et al. would also be recognized in the fiber end face having the dielectric coating.

25. The method claims would also be obvious as setting forth requisite steps.

Response to Arguments

26. Applicant's arguments filed June 23, 2005 have been fully considered but they are not persuasive.

27. Applicant states that Kato teaches expanding the misalignment tolerance to simplify assembly of an LD module. Applicant further states that increasing the spot size in Kato may have an adverse effect of eliminating the advantages of increase misalignment tolerances.

28. The rejection above states that Kato et al. discloses an optical device comprising a TEC optical fiber including a first core, wherein a diameter of the first core at a first end of the TEC optical fiber is larger than the diameter of the first core in an unexpanded portion of the TEC optical fiber; and a focusing lens (aspheric lens) configured to focus light into the first end of the TEC optical fiber such that a light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber. The rejection further states that Kato et al. does not specifically disclose the light spot diameter to be no larger (i.e. smaller) than the diameter at the first end of the TEC optical fiber.

29. Kato et al. clearly discloses a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC. The rejection is not directed at providing obvious rationale for further increasing the light spot diameter. The rejection is directed at the combined teaching of Kato et al. and Papademetriou et al. to clearly render obvious a light spot diameter to be no larger than the diameter at the first end of the TEC fiber of Kato et al.

30. Applicant also states that the teachings of Papademetriou et al. are difficult to apply to a TEC fiber since the fiber in Papademetriou et al. only has one core diameter. Applicant additionally states that there is no suggestion or teaching in Papademetriou et al. regarding what the spot size should be to minimize energy losses when a fiber has two different core diameters. Examiner respectfully disagrees.

31. One of ordinary skill in the art would have recognized that the teaching of Papademetriou et al. would have been critical at the coupling portion of an optical fiber, which is the end face of an optical fiber. Any additional core diameters remote from the coupling region would have been immaterial to the efficiency of incoupling light at the end face. As shown in Figure 1, the coupling region of the TEC fiber of Kato et al. comprises the expanded core diameter. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the light spot diameter should not exceed the core diameter of the expanded region (coupling end face) of the TEC of Kato et al. to minimize energy losses as suggested by Papademetriou et al.

32. Applicant further states that such a modification requires increasing the spot size such that it is larger than the core diameter of the unexpanded portion of the TEC fiber, and likely increasing energy losses. As noted above, Kato et al. independently discloses a light spot

diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC. Therefore, the restriction of providing a light spot diameter less than the fiber core at the expanded portion would not have increased the energy losses as asserted by Applicant.

33. In conclusion, Kato et al. discloses the claimed invention but does not expressly disclose the light spot diameter to be no larger (i.e. smaller) than the diameter at the first end of the TEC optical fiber. Kato et al. clearly discloses a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC. The combined teaching of Kato et al. and Papademetriou et al. to clearly renders obvious a light spot diameter to be no larger than the diameter at the first end of the TEC fiber of Kato et al. to minimize energy losses.

Conclusion

34. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sarah Song whose telephone number is 571-272-2359. The examiner can normally be reached on M-Th 7:30am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on 571-272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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